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Ways of
Making
Southern
MOUNTAIN
FARMS
more
Productive

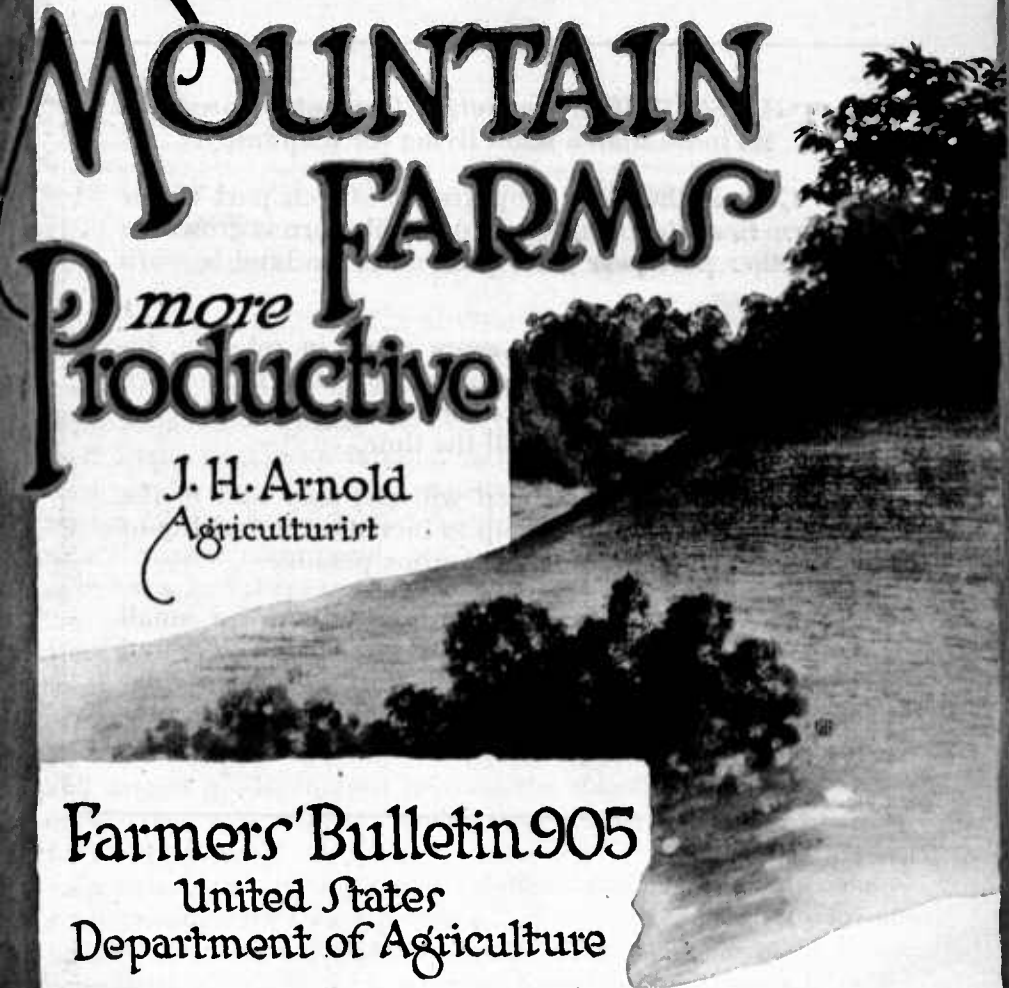
J. H. Arnold
Agriculturist

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THE SOUTHERN mountain farm often produces no more than a scant living for the family.

Corn is the chief crop grown. Often part of the farm lies idle, being "rested," while corn is grown on another part year after year until the land is worn out.

By growing three or more crops in rotation, including clover, the farmer will be able to produce larger crops, make more money, and keep all crop land under cultivation all the time.

Cattle, hogs, and sheep will not only add to the cash income, but will help to increase the fertility of the soil, and render larger crops possible.

This bulletin describes crop rotations for small mountain farms in the southern Alleghenies, and gives complete directions for starting a crop rotation that will make poor mountain land more productive.

WAYS OF MAKING SOUTHERN MOUNTAIN FARMS MORE PRODUCTIVE.

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FARMING CONDITIONS IN THE MOUNTAINS.

NEARLY THE WHOLE of West Virginia, a large part of Kentucky and of Tennessee, and the western portions of Virginia and North Carolina form a more or less distinct agricultural region, rugged and mountainous, but thickly settled with people who make their living mainly by farming. Three million five hundred thousand people would be a fair estimate of the farming population living on approximately 500,000 farms. Not counting towns, there are nearly twice as many people per square mile in this mountain region as in Iowa, and about the same number per square mile as in the rich blue-grass region of Kentucky.

As a rule the small mountain farm does not produce more than a scant living for the farm family. Even when there are additional earnings from outside sources the total income is usually small. Besides necessary clothing considerable quantities of meat, flour, and canned goods, shipped in from the outside, are bought. Frequently hay and grain are hauled long distances over bad roads to feed work stock.

In some parts of this rough mountain region large or medium-sized grazing farms have developed. These are usually situated on lands well adapted to pasture grasses. The small mountain farms considered in this bulletin, however, have only small areas in cultivation or pasture, and are usually out of reach of markets for staple farm crops. Often to reach these farms it is necessary to travel from 10 to 35 miles from a railroad, sometimes over rough, hilly roads, which during the winter and early spring are frequently impassable

for wagons or other vehicles. Many farms can be reached only by traveling on foot or horseback over mountain trails. Under these conditions the mountain farmer, as a rule, aims to produce no more than can be consumed profitably at home. Occasionally also such home industries as spinning, weaving, or the making of furniture and baskets are maintained, so that a fairly comfortable living may be had without much trading and use of money.

Some mountain farms, however, are more favorably situated. Farms along the larger streams, which follow winding courses

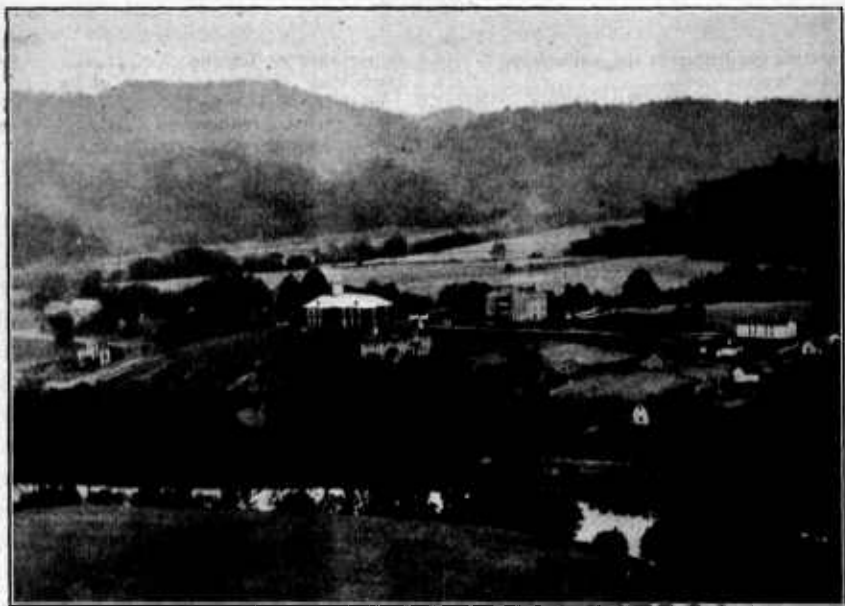


FIG. 1.—View of Onelda Institute, Clay County, Ky. This is a private school for the education of mountain youth, founded by John Burns, who was reared on a farm near by. A farm is connected with the institution to raise food for teachers and students and to provide work for students who must pay their way by labor. The stream in the foreground is a branch of the Kentucky River.

through narrow strips of bottom land between hills or mountains, have some level land. These are fortunately situated, for they usually have access to the main roads, and the level alluvial bottoms are frequently enriched by the overflow of streams. Others are situated on high and more or less level plateaus, where usually it is comparatively easy to cultivate land and to reach markets. In the foothills of the mountains, and scattered here and there in the more fertile lowlands, are farms with more or less level but thin and stony land, often poor in quality. These are also classed as mountain farms, since they are managed in about the same way as are the farms on the steeper lands.

In the densely populated sections, where the majority of farms are largely rough forest land, the area that can be used for growing crops is limited, and under present management and practice hardly enough land is available to produce the food necessary for home consumption. Hence, the small area under cultivation is devoted largely to crops which have high food values, such as corn and beans. There is little pasture for live stock. In places not quite so thickly populated, where the land is not so rough, and where some parts of the farm may be devoted to wheat, rye, clover, and grasses, the improved areas are larger, a smaller proportion of the cultivated land is devoted to corn and beans, and more live stock is raised.

These mountain farms usually range in size from 40 to 200 acres. Generally about one-fourth to one-third of the farm area is cultivated and the remainder is left in woods. Sometimes these woods furnish a small amount of pasture and occasionally there is some open pasture in addition to the cultivated land.

SOME TYPICAL FARMS.

On the small mountain farms in the more thickly populated districts of eastern Kentucky, a fairly representative section of the mountain region, the land is usually distributed about as follows:

	Acre.
Woods	48
Idle land "resting" or partly in pasture	20
Corn	12
Hay or other forage	2
Oats	1
House and barn	$\frac{1}{2}$
Garden	$\frac{1}{2}$
Sorghum	$\frac{1}{4}$
Potatoes	$\frac{1}{4}$
Beans	$\frac{1}{4}$
Orchard	$\frac{1}{4}$

Corn is the main crop here. It produces more food per acre than any other crop. Beans, Irish potatoes, and sweet potatoes are important. About one-half acre is commonly devoted to a garden which supplies vegetables during the growing season. Honey, sorghum, and molasses take the place of sugar. Most mountain farms produce, in addition to other crops, more or less fruit. Some wild fruits are still available.

Hogs, which are depended upon mostly for meat, get a large amount of their food from nuts and acorns, locally known as "mast." Frequently, however, mast fails, and there is an increased demand on the corn crop for feeding. Most farms possess at least a cow or two, and frequently a few sheep are kept to produce wool and meat.

A large number of the cattle purchased by the lowland farmers are raised on these mountain farms. They are usually sold when yearlings or 2-year-olds. In Tennessee and in parts of other States it has long been the practice of farmers in the lowlands to buy in the fall mountain ewes to breed and raise lambs for the early summer market. This has been profitable, especially on farms raising considerable winter wheat, which can be grazed by sheep. Many such ewes are sold by these mountain farmers.

According to the latest United States census, it is calculated that the average receipts on about 100,000 mountain farms were as follows:

Live stock.....	\$80
Poultry and eggs.....	2
Dairy products, mainly butter.....	18
Total.....	100

Of course, practically nothing is sold from many of these farms, especially the smaller ones, while the larger and more prosperous have an income of several hundred dollars from live stock and live-stock products.

Where there is a larger proportion of tillable land than is found on the typical mountain farms, it is possible to devote a proportionally larger area to small grain, clover, and grasses, somewhat as follows:

	Acres.
Woods.....	46
Idle land ("resting," sometimes partly in pasture).....	25
Corn.....	15
Hay and other forage.....	3
Oats.....	2
Wheat.....	2
Rye.....	1
Sorghum.....	1
House and barn.....	$\frac{1}{2}$
Garden.....	$\frac{1}{2}$
Orchard.....	$\frac{1}{2}$
Potatoes.....	$\frac{1}{2}$

This type of mountain farm is found in the more level portions of the mountain region, in the foothills, and on the thinner and poorer soils in the lowlands. While on the average farm of this type the area devoted to crops is larger than on the type of farm just described, the amount of corn raised is about the same. There are practically no beans, these being replaced by wheat and rye. More hay and other forage is raised and more land can be utilized for pasture. There are more cattle and sheep, but usually fewer hogs. Generally speaking, these farmers have larger incomes, devote less time to home industries, and buy more off the farm than

those on the farms with smaller crop areas. The farms are, as a rule, more accessible to railway market points.

Small farms of still another type are found on the high mountain plateaus, where conditions usually are more favorable for meadow and pasture grasses. The following is the typical distribution of acreage of this type of farm, containing usually 80 to 100 acres, on the high plateaus of northern West Virginia.

	Acres
Woods.....	24
Woods pasture.....	12
Permanent pasture.....	15
Rotation pasture, or idle land "resting".....	6
Corn.....	6
Hay or other forage.....	14
Oats.....	4
Wheat.....	2
Buckwheat.....	2
House and barn.....	$\frac{1}{2}$
Garden.....	$\frac{1}{2}$
Potatoes.....	$\frac{1}{4}$
Orchard.....	$\frac{1}{4}$

The most striking feature in the cropping system on these farms is the small amount of corn raised. The land devoted to hay and other forage is about equal in amount to land in field crops. A much larger portion of the land is used for pasture than is found on farms of the type previously described, and in proportion to the crop area about twice the amount of live stock is carried. This live stock, of course, is mainly cattle and sheep. Fewer hogs are kept than on the other types of mountain farms. Wheat, oats, and buckwheat are the small grains usually raised. Beans and sweet potatoes are not raised to any great extent. Crop yields are notably higher than on the other farms described. Corn usually makes 25 to 40 bushels per acre, wheat 10 to 25 bushels, and oats 12 to 30 bushels per acre, whereas on the other types of small mountain farms corn generally yields 10 to 25 bushels per acre, wheat 5 to 10 bushels, oats 10 to 15 bushels, and rye 5 to 12 bushels. These higher yields, no doubt, are largely due to better soil and better farm practices. Here, for instance, sod land is frequently turned for corn, to be followed by small grain crops, while on the other farms described there is little or no attempt to rotate crops. The income from such farms is usually sufficient to support a family fairly well. Many families, however, must necessarily add to their income by labor off the farm.

OPPORTUNITIES FOR SPECIAL PRODUCTS.

In a few localities markets for farm products other than live stock and live-stock products have developed. In the vicinity of Chatta-

nooga, for instance, many mountain farmers have found it profitable to grow and market strawberries. In northwestern West Virginia, near the headwaters of the Potomac River, the growing of tomatoes for canning has developed to a considerable extent. In this same region the raising of peaches and apples is quite extensively developed even on the smaller-sized farms. On the high plateaus, especially in West Virginia and Tennessee, the growing of Irish potatoes is profitable where markets are within reach. In the vicinity of mining villages and towns, opportunities are afforded for the growing of a surplus of garden vegetables, orchard fruits, and various small fruits. The production of market milk and poultry products is also found to be profitable. Such special opportunities, however, are still very rare. The large majority of farmers in the mountains can not profitably market a surplus of perishable products, but must continue to depend almost wholly on live stock and certain concentrated forms of live-stock products, such as bacon, cheese, butter, and eggs, for cash income. Cattle and sheep may be driven long distances to market. Even hogs can be transported considerable distances on the hoof, and in some localities turkeys are driven in large flocks to market.

Mountain farmers, generally, are skilled in curing meats, especially bacon and hams, and at present prices the production and sale of these products should be profitable, even on farms located many miles from a railway. In some places navy beans have been grown with marked success, and at present prices they could profitably be hauled long distances to market.

This region has many advantages for the production of cheese. In some respects conditions are considered better than those of the principal cheesemaking centers of the United States, New York and Wisconsin. The summer climate is not usually excessively hot and springs are abundant. While many parts of the region are not well adapted to pasture grasses, yet a sufficient amount of pasture can usually be found for a few cows. For many years a few localities in this region have produced and sold a considerable amount of cheese and butter; and, as a rule, farmers engaged in this industry have much better crop yields and larger incomes than the average. Recently a few cheese factories operated cooperatively by farmers have been established in mountain communities, some of them far from market points. These have been remarkably successful. They were started under the general supervision of the Bureau of Animal Industry, United States Department of Agriculture. The cost of equipping one of these small factories rarely exceeds \$1,000. This would cost 20 farmers \$50 each. The plants must be supervised by persons skilled in cheesemaking, hence factories have not increased as fast as they otherwise would.

The raising of hogs fits in well and is made more profitable in connection with cheesemaking. The whey, a by-product in cheesemaking, is a valuable food, especially for sows and pigs. It is reported that in one mountain community hog production has increased ten-fold since the making of cheese began.

SUGGESTIONS FOR BETTER MANAGEMENT.

The low yields on mountain farms are, as a rule, due more to the faulty cropping systems commonly followed than to poor soil. Crop rotations and the use of legumes for improving the soil are seldom practiced. Except to fertilize the garden, little use is made of stable



FIG. 2.—A cooperative cheese factory which was established in the mountains with the help of the Bureau of Animal Industry, United States Department of Agriculture. Hogs in the foreground feeding on whey. It is estimated that ten times as many hogs are raised here now as before the cheese factory was established. Ten pounds of whey have about the same feed value for hogs as 1 pound of corn.

manure. Clover, winter wheat, or rye are seldom used as winter cover crops. Except where the soil is unusually favorable, very small space is devoted to grass. Many small farms have no pasture or meadow, nearly all the crop land being devoted to corn and the garden.

Land which no longer produces well is commonly referred to as being "tired." The usual practice is to let such land lie idle for a few years to "rest" while the crop is shifted to a "rested" patch of ground which usually has grown up in young trees. This is especially the practice with corn, which exhausts the soil very quickly. Even in rich coves on mountain sides, three or four years of successive cropping makes the soil unprofitable for grain crops until "rested." Low bottom lands, which occasionally overflow, may be planted to

corn each year almost indefinitely without any reduction in yield. Only a few mountain farms, however, are thus fortunately situated.

By improving the cropping system, increasing the live stock, and using practical measures at hand for soil improvement, the mountain farmer can greatly increase production and maintain the fertility of the soil. At the same time opportunity is opened for a more profitable use of his own time and that of his family.

INCREASING YIELDS BY ROTATION.

Growing a different kind of crop on the land rests it as well as, or better than, letting it grow up to weeds. At the same time this practice brings the farmer more money, since it keeps the land busy raising crops all the time. When several crops are grown in this way the arrangement is called a "rotation," because the crops go around or rotate from field to field. Thus in a four-year rotation the land used for crops is divided into four fields, and each year for four years a different crop is grown on each field. The fifth year each field grows the same crop it grew the first year, and so on. The period of rotation may be two, three, four, five, or more years, depending on what farmers have found by experience to be the best practice.

Suppose a farmer wants to start a four-year rotation of corn, soy beans, rye, and clover. The first step is to provide four fields of about equal area. One arrangement of such fields is shown in the diagram below. Because rye is sown in the fall, and clover is sown on the same field the following spring, a full year before it is harvested, the rotation can not be started in full in one year.

<p>Corn.</p> <p>No. 1.</p>	<p>No. 2.</p>
<p>No. 4.</p> <p>Soy beans.</p>	<p>No. 3.</p>

Beginning in the spring of the first year, corn is planted in field 1, and soy beans in field 4. In the fall rye is sown on field 4, after the soy beans are harvested.

In the spring of the second year corn is planted in field 2, soy beans in field 1, and clover is sown on the rye in field 4. During the summer of the second year the fields will bear regular rotation crops as follows:

Soy beans. No. 1.	Corn. No. 2.
No. 4. Rye. (Young clover.)	No. 3.

In the fall of the second year rye is sown on field 1 after the soy beans are off.

In the spring of the third year corn goes in field 3, soy beans in field 2, and clover is sown on the rye in field 1. In the summer of the third year the crops are arranged as follows:

Rye. (Young clover). No. 1.	Soy beans. No. 2.
No. 4. Clover.	No. 3. Corn.

The rotation is now in full swing, the crops following each other around the circle in regular order.

During the summer of the first year fields 2 and 3 are not yet in the rotation and are available for any suitable crops or pasture. The same is true of field 3 during the second summer. These fields, of course, should not be planted in crops that will be in the way when they are needed in the rotation. Since field 2 is idle one year, none but a one-year crop should be grown on it. Field 3 does not come into

the rotation till the third year, so that it may be used either for an annual crop, such as corn, sorghum, potatoes, and the like, or for a winter grain, like wheat or rye.

After the rotation is fully established the succession of crops on the various fields is as follows:

Fourth year clover. Fifth year corn. Sixth year soy beans. Seventh year rye. Eighth year clover.	Fourth year rye. Fifth year clover. Sixth year corn. Seventh year soy beans. Eighth year rye.
Field 1.	Field 2.
Field 4.	Field 3.
Fourth year corn. Fifth year soy beans. Sixth year rye. Seventh year clover. Eighth year corn.	Fourth year soy beans. Fifth year rye. Sixth year clover. Seventh year corn. Eighth year soy beans.

This arrangement gives the same acreage of each crop each year, and does not bring the same crop on the same field oftener than once every four years. In this way each field, once every four years, gets the benefit of a crop of clover as well as of soy beans, both of which are good for the land.

Not only does following a rotation enable the farmer to grow more acres of crops and get better yields than he can when part of his crop land is lying fallow, but the practice enables him to save labor on some of his crops. If a cornfield has been kept clean by cultivation it is in good condition for a crop of small grain without further preparation. Grass and clover seed may be sown with the small grain, thus saving extra preparation of a seed bed. The grasses and clovers tend to improve the soil, counteracting the effects of the grain crops. Thus the land is "rested" while in continual and profitable use.

Usually in mountain farming the fields can not be laid out regularly, as indicated in the diagram above, since the tillable land generally lies in irregular patches here and there on the farm. The essential thing to do, however, is to put out each year on the various fields about an equal acreage of each of the rotation crops.

Generally it is not practical to follow without change a rotation plan, since various difficulties will arise to interfere with it. Sometimes, for instance, clover or grasses will fail to make a stand, in which case a second attempt may have to be made. For special reasons it may be best to increase the corn acreage one year or make less another, and so on with other crops; but the general rotation

plan should always be kept in mind and followed as nearly as possible.

Some mountain farmers have demonstrated the value of improved methods which make more intensive use of the land, and not only maintain its fertility under continuous use, but increase crop yields much beyond those of newly cleared lands.

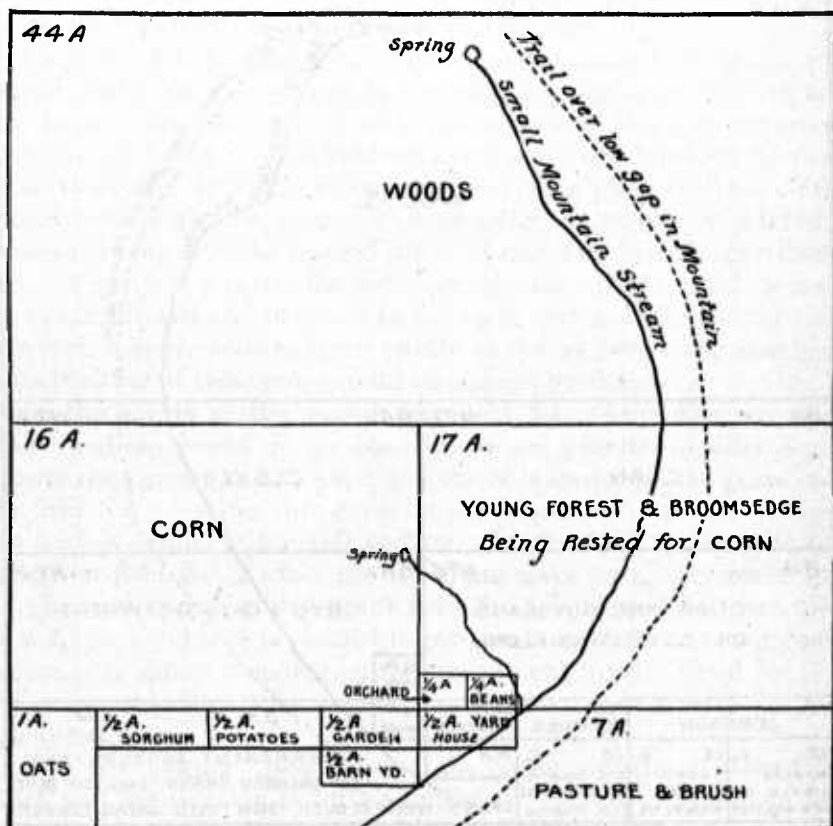


FIG. 3.—Approximate proportion of land in various crops and in woods on an 88-acre farm in the rugged mountains of eastern Kentucky. This arrangement is typical of the way in which land is utilized by farmers in the southern Appalachians.

CROPPING SYSTEM ON A TYPICAL FARM.

The usual cropping system on an 88-acre mountain farm which has been run for many years is shown by the diagram in figure 3. The total yearly production of corn has been about 250 bushels, oats 15 bushels, Irish potatoes 40 bushels, sorghum molasses 50 gallons, honey 40 pounds, and beans about 2 bushels. The garden ordinarily supplies about 30 bushels of sweet potatoes, besides peas, onions, and other common summer vegetables.

Managed in this way the farm can carry one or two cows, two or three young stock, and a sow with five or six pigs. Several sheep,

which live mainly on pasture in the woods and waste places, are usually kept. One horse could do the work on the farm, but two horses and a wagon are kept to haul ties, lumber, posts, or provisions, besides doing the farm work. It is readily seen that a farm managed in this way can supply only the bare necessities for a family

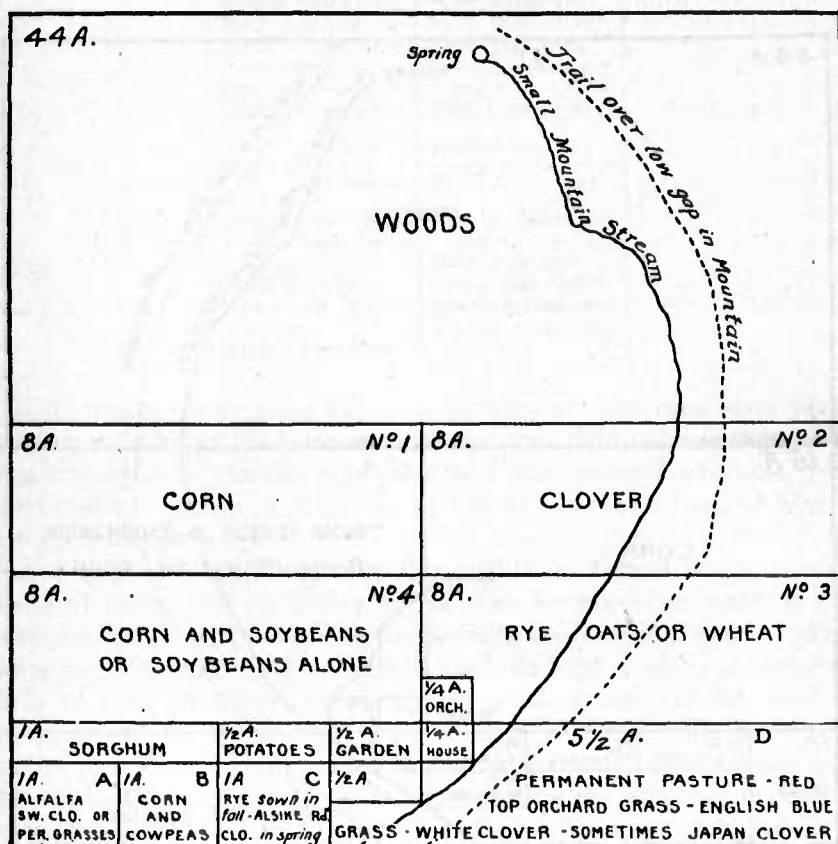


FIG. 4.—A better cropping system for the farm shown in figure 3. The fields are arranged for a four-year rotation of (1) corn, (2) soy beans, (3) small grain, and (4) clover. The fields of course, can not, as a rule, be uniform in shape or size, as are the fields shown in the diagram, but, even when the tillable land is in scattered patches, they can be handled so that there will be approximately equal acreages of crops each year.

of eight persons. It is impossible for anything to be left over for the support of community interests or to educate the children properly.

REPLANNING FOR PROFIT.

Without any increase in the tillable area, such a farm can be managed so as to yield a more satisfactory living and something besides. The diagram in figure 4 shows a possible rearrangement of

the cropping system on this farm. The suggestions given are based on the experience of practical mountain farmers.

Instead of relying on shifting the corn field to new or "rested" land every few years in order to maintain even a low yield, provision is made for a rotation which keeps all the improved land continually in crops and at the same time increases yields. The diagram shows a four-field system to be run in a four-year rotation. This is substantially the rotation already outlined on page 10.

Field No. 1 is plowed in the fall or early spring, to be planted to corn. Field No. 4 is plowed in the spring and planted to corn and soy beans. In some cases it might be advisable to plant the whole field to soy beans. Some farmers plant this crop in alternate rows with the corn. It is also a common practice to plant cowpeas in the same rows with the corn. This practice is especially advisable when the crop is to be hogged off or if the corn is to be put into a silo. Field No. 4 (after the soy beans are harvested) could be sown to rye in the fall and to clover in the early spring of the second year. Or such a field could be sown partly to rye or wheat and partly to oats if either of these crops could be utilized profitably.

In the spring of the second year field No. 2 is plowed for corn. Corn and soy beans or soy beans alone are planted in field No. 1, where corn grew the first year, and clover is seeded on the grain crop in field No. 4. After this grain crop has been cut, the clover comes on and is available for fall pasture. In the fall, rye or wheat is sown on field No. 1 after the soy beans have been harvested.

The next spring (third year) field No. 3 is plowed for corn, field No. 2 (corn stubble) is planted to corn and soy beans or to soy beans alone, and clover is seeded on the rye in field No. 1. Field No. 4 is in clover, which may be cut for hay in late June or early July, or pastured.

The next spring (fourth year) the clover stubble is plowed for corn and the rotation is fully established. The fifth year corn will get back to field No. 1, where it started the first year, and a new rotation will be begun.

Rye may be used in several different ways. It makes good early winter pasture, especially for sheep. It is also better for the land than oats, because it provides a winter cover crop, thus keeping the soil from washing. It may be harvested for hay or for grain, or it may be hogged off.

When the land is brought to a good state of fertility by such a rotation, hairy vetch may be sown with the rye in the fall, thus increasing its value as hay, pasture, or as a grain crop. Rye and vetch mature at about the same time, and they may be thrashed together, the grain making excellent feed for stock. On rich soil, Canada field peas may be sown on the unbroken surface, plowed

under 4 or 5 inches deep, then the ground sown with spring oats. This combination considerably increases the value of the crop for hay or for hogging off.

Besides the general field crops in the four-year rotation, provision is made for pasture for hogs. This is an important feature in the farm plan, especially where hogs are depended upon for the principal cash sales.

Hogs are most cheaply raised when they can be furnished considerable pasture, this being especially important for sows with pigs. A good pasture scheme for hogs should provide a succession of crops in addition to some kind of permanent pasture. Each field should be fenced hog tight and be accessible to water.

The scheme in figure 4 provides three fields of one acre each. Corn and cowpeas and rye with clover are planted in a two-year rotation. For instance, field B, after being hogged down in the fall, is sown to rye. In the early spring, February or March, red clover is sown. The best time is when the ground is freezing or thawing, or when the clover seed may be harrowed in without injury to the rye. The rye may be pastured a short time in the early spring, after which the hogs may be turned into field A in permanent pasture until the rye is sufficiently matured to hog down, when they may go into field C. Thus they may be shifted from one field to another, and sometimes to other fields on the farm, especially the clover field shown in the diagram as field No. 4.

Such a hog pasture when brought up to a good state of fertility should provide sufficient pasture for 15 to 20 hogs. To bring them to 200 or 250 pounds weight, 200 to 250 bushels of corn or its equivalent would be needed, in addition to the pasture. The cropping system as outlined should easily provide this amount of corn for the hogs. When there is "mast" in the woods, additional hog feed is available which to a large extent may be substituted for corn. Instead of 18 bushels per acre, the usual yield under the old system of farming, at least 35 bushels of corn per acre should be produced, giving 560 bushels for the farm, a quantity sufficient for the needs of the family and for the increased number of live stock.

The permanent pasture for hogs is an important feature in the plan for hog raising. This can be used at any time when the other fields are not ready to pasture, or if for any reason it is not advisable to pasture them.

Alfalfa makes an excellent permanent pasture and is recommended, especially where a considerable area of bluegrass or other pasture grasses is not available. The land on which alfalfa is to be sown should be well manured and limed. If it is impossible to haul lime to the farm, or if it can not be burned in the vicinity or on the farm, wood ashes, which are sometimes available, may be used instead. To

get the best results, 2 to 3 tons of wood ashes should be used on an acre. Brush, old logs, and leaves, where available, may be burned on the land, thus greatly improving the soil for alfalfa.

The preparation of the seed bed for alfalfa should be begun early in the season. The land should be worked frequently with a harrow and hoes during the summer to keep down weeds which take up the moisture. The seeding may be done late in August or early in September.

It will be necessary, in order to get a good stand of alfalfa, to inoculate the soil with soil from another alfalfa field, or to inoculate the seed with material which can be bought from fertilizer and seed dealers, or can be obtained free in small quantities from the United States Department of Agriculture.

Sweet clover is an excellent pasture plant for hogs, and may be sown in place of alfalfa. If given the opportunity, it will reseed itself each year, while the alfalfa plant holds the ground year after year indefinitely. The two often grow well together and may be sown in a mixture, the requirements in soil preparation and inoculation being the same for each. As a rule, however, better results are obtained with sweet clover by sowing in the spring than in the summer or fall.

On well-limed, rich soil bluegrass makes a good permanent pasture. In some places bluegrass and sweet clover have done well together. On soils not adapted to Kentucky bluegrass, a mixture of red top, orchard grass, English bluegrass, white clover, and alsike makes a good permanent pasture for hogs. In some localities Japanese clover may be added.

The new arrangement, as indicated in figure 4, provides $5\frac{1}{2}$ acres of permanent pasture which may be used for cattle, sheep, or possibly for hogs at times. Besides this, considerable pasture is available from clover, as shown in field No. 2. Bluegrass makes the best permanent pasture for cattle, sheep, or horses where the soil will grow it without special preparation. On most mountain farms, however, Kentucky bluegrass does not grow well, the pasture grasses well adapted to mountain soils being red top, orchard grass, and English bluegrass.

This farm, rearranged, should carry at least three cows and three to five young stock—calves, yearlings, and 2-year-olds. It may often be profitable to keep several sheep to clean up the wastes about the farm and to pasture winter grain. Sheep are light in weight and do not injure the fields to any extent when the ground is soft. They will eat the weeds and tender tree sprouts which tend to crowd out pasture grasses. Turned in a field of winter rye, wheat, or oats after clover seed is sown, they will tramp in the seed, thus practically insuring a stand.

Cows can be made more profitable on mountain farms if there is opportunity for cheese production. (See page 8.) It has been found profitable to market cheese at long distances from market. Two or three hundred pounds may be carried on the back of a horse or mule. Cheese, as well as bacon and other pork products, now has a high value per pound, making it a highly profitable product for mountain farming. The high food value of these products in proportion to their weight and their keeping quality make them readily marketable in any part of the world where they are used for food. As was previously stated, the cheese industry is being rapidly developed in parts of the lower Appalachian Mountain region, and mountain farmers generally are advised to give it careful considera-



FIG. 5.—A type of the better mountain farmhouse. This is the home of the owner of a small mountain farm on the Cumberland Plateau in Tennessee. With little added expense any farmhouse can be built to present a neat and pleasing appearance, and ivy, vines, and shrubs to beautify the yard can be planted and grown practically without cost.

tion. Pork production fits in well also with cheese production, because hogs utilize to good advantage the whey, a by-product of cheese making.

It will be seen that no change is made in the usual plan for the home garden and for raising such crops as potatoes, beans, and sorghum for home use. The present arrangement is about as good as any that could be suggested. The sorghum patch may frequently be increased, however, with profit, since, besides being utilized for making molasses, it is an excellent forage crop for stock. An extra half acre could be used to good advantage for this purpose.

A farm such as this, even though it can not reach a market by wagon road, may profitably market its surplus products, which

would be live cattle, cured meats, cheese, if a factory were available; and possibly a few lambs. Instead of a cash income of \$100 to \$200, the most that could be expected from such a farm under the old way of management, under the new system, without an increase in the tillage areas or a change in market facilities, the farm should have a cash income of not less than \$500 to \$800, which would make possible a much higher standard of living than that under the old system. (See fig. 5.)

In many cases the owner could continue seasonal work in lumbering, in hauling, or in the coal mines, while others of the family could do successfully most of the necessary farm work. The new system need not interfere to any extent with any home industries already



FIG. 6.—This is a mountain corn-club boy preparing a seed bed for corn. One-horse implements are common on mountain farms.

established, such as spinning, weaving, and making baskets and furniture, and does not necessitate any increase in number of work stock kept.

IMPORTANCE OF MANURE.

The rotation of crops as outlined can not be depended upon alone, however, to increase and maintain crop yields. The soil must be kept abundantly supplied with vegetable matter for humus, such as manure, cornstalks, straw, leaves, and such crops as rye, clover, and cowpeas plowed under. Grass, because of its extensive root system, is an important crop for putting organic matter into the soil. This is probably the main reason why good crops are usually obtained after breaking a well-sodded meadow or pasture.

For general farm purposes, stable manure is the best fertilizer known, since it contains all the essential plant foods and is instrumental in making more available the plant foods already in the soil. It is, therefore, of the greatest importance that the manure produced

on the farm be well taken care of and scattered on the land where needed. Manure should not be left to waste out of doors, but when possible taken from the stables each day and applied directly to the land. When this can not be done it should be piled under cover until it can be properly used.

The mountain farmer who can till but a small portion of his land will find it exceedingly profitable to take particular care not only of the manure but of all waste vegetable matter which may be put into the soil to make humus. Waste straw, fodder, and hay, even leaves from the trees in the woods, may be gathered and used for bedding for animals, thus increasing the amount of manure. These are often profitably utilized in making compost, which is simply rotted ma-



FIG. 7.—Where deep plowing is desired it frequently is necessary to use all the work stock on the place in one team.

nure and waste vegetable materials such as have been described mixed with earth. This material is especially good for garden fertilizer.

A compost heap is made by piling manure, various refuse materials, and earth in alternate layers, to be left until the coarse matter is well rotted. The sides of the pile should be built up perpendicularly, the center and the top being kept about level, so that rain falling on it will be absorbed to keep the material moist. In a year or two after the process is started the compost will be ready for use on the garden. There should be at least two compost piles on each farm, so that one pile will be available for use each spring.

On such a farm as that first described (p. 14) there should be sufficient manure, if properly cared for, to cover one of the 8-acre fields each year, besides enough for the garden and other small areas devoted to special crops.

The drainage of the land is another matter to be looked after. Crops will not do well unless water drains readily beneath the surface. During the wettest times water should not stand within less than 2 or 3 feet from the surface.

On most mountain farms with but small areas of cultivated land, the most practical way to drain the land is usually by digging ditches 2½ to 3 feet deep and filling in several inches with stone, or by laying in the bottom of the ditch 3 or 4 poles or small logs and covering them with brush, grass, or leaves before filling in with soil. Of course an outlet must be provided and enough slope given in the bottom of the ditch to permit the water to run off readily. Where drain tile is available and the farmer can afford it, this should be used instead of stone and logs.

Often during wet weather the water comes to or near the surface on high ground, frequently even near the top of a hill or mountain, forming a spring that keeps a considerable amount of land around it wet. This condition can often be prevented by digging a ditch above and around the wet area in such a way as to drain the water entirely off this ground.

Where stones lie loose or imbedded in the soil good use can be made of them by putting them into drainage ditches, or using them to build fences or dams to prevent washing.

The location and arrangement of fields and the way of planting crops are important matters in mountain farming. The title-page picture illustrates an ideal practice for many steep mountain farms. The tillable land is located around the base of the mountain. The forest above breaks the force of water flowing down after heavy rains or the melting of snows. The frequent flowing of water from this wooded area brings with it vegetable matter and plant food from the forest area above. The rows are planted in curves around the hills instead of up and down. These rows, one above the other, form narrow terraces, which break the force of water as it flows down the hill. This practice greatly lessens the danger of washing, one of the main difficulties in farming steep mountain land. The sandstone and shale soils, however, are much less liable to bad erosion than even the more level limestone soils. The reason seems to be mainly the fact that these steep mountain lands usually have a loose subsoil and a stony top soil that permits rapid absorption of water, thus lessening the force of the flow on the surface.

Nearly all mountain soils are benefited by lime, but most of them are situated so that it is not practicable to haul lime from market points, and in a large majority of cases there is no limestone in the vicinity for producing it. As previously stated, wood ashes may take the place of lime, but ashes are not available in sufficient quantities to cover any but small areas. One or two thousand pounds of burnt

lime per acre applied to the land every four to six years will greatly increase crop yields, and it would pay farmers to haul it quite long distances and apply it to their lands. It is especially beneficial for clover, practically insuring a stand and vigorous growth. Figure 8 shows how farmers burn lime when the limestone is available. Figure 9 shows a method of spreading lime evenly over the ground.

Crops also are usually benefited by the use of commercial fertilizers, especially acid phosphate, which, on such grain as rye, wheat, or oats, may be applied at the rate of 200 to 250 pounds per acre. When plenty of stable manure and various kinds of refuse vegetable matter on the farm are available and put into the soil



FIG 8.—A mountain farmer constructing a limekiln preparatory to burning. Wood is piled at the bottom of the kiln and a flue put up through the center so as to permit a draft when the fire is started. A space filled in with kindling usually extends lengthwise underneath the pile, and the fire is started at one end. The chinks between the logs are filled in with small sticks, cornstalks, or other trash, to make the fire start easily. When coal is used, there are usually alternate layers of fine coal and limestone, 2 or 3 inches of coal and 4 or 5 inches of stone, the pile being drawn into a peak at the top 7 or 8 feet high. Wood alone is often used.

other fertilizers, such as nitrogen and potash, are not needed. All legumes, such as clovers, peas, and beans, are especially valuable for the soil, since they supply nitrogen obtained from the air. If the soil is very poor and needs especially nitrogen and organic matter, a crop of cowpeas is one of the best crops to begin with. The whole crop should be turned under, however, in order to get full benefit from it.

IMPROVING THE MANAGEMENT OF A SMALL GRAZING FARM.

The distribution of acreage shown on page 24 illustrates the usual practice on the grazing type of small mountain farm, a type most

common on the high mountains and plateaus in West Virginia and in some other places similarly situated. These farms are largely in meadow and pasture, and a relatively small area is devoted to corn. The yield of corn, however, is usually higher on these farms than on mountain farms farther south in Kentucky and Tennessee. This is explained by the facts that the richest portions of the farm are selected for the corn and that it is a frequent practice to turn sod for corn.

Without increasing to any extent the amount of cultivated land or changing the type of farming, the income on these farms can be greatly increased by a more systematic rotation of crops, better utilization of manure and other by-products usually wasted, and better care and utilization of pasture lands.



FIG. 9.—This shows a common method of spreading lime. It is not the best method for large or medium-sized farms, but it is recommended for small farms on which it does not pay to keep a lime spreader. Squares are marked off on the field about 1,742 square feet in size, or a little less than 42 feet on a side. One bushel of lump lime, or its equivalent, about 2 bushels of air-slaked lime, placed at each intersection of the marks and scattered evenly, will put on the land about 1 ton of burnt lime per acre.

Figure 10 shows how the crops should be proportioned on such a farm to establish a more systematic rotation. Usually as much of the farm as can be developed into permanent pasture without too much expense, on land which is not suitable for cultivation, should be used for grazing. The land that can readily be brought under cultivation should be put into crops and handled in as regular a rotation as possible. In this rotation a clover and grass crop should hold the land at least one or two years for meadow or pasture.

At least three acres should be devoted to a succession of crops for hog pasture. This would enable the farm to carry more hogs and make it possible to raise them at low cost. Bacon and other cured pork products, at present prices, would find a profitable market, even though the farm is a long distance from the nearest railway point. These products also will find a ready sale in near-by mining towns.

In this pasture rotation for hogs, corn would be followed by oats in the spring. Canada field peas may be sown before this ground is plowed, turned under four or five inches deep, and oats sowed and harrowed in, thus greatly increasing the amount of feed produced on the land. This is good practice, especially where the oats are to

8 A. CORN	4 A. OATS	16 A. PERMANENT PASTURE		
	3 A. WHEAT OR RYE			
	1 A. BUCKWHEAT			
8 A. MEADOW	8 A. PASTURE IN ROTATION	1/2 A. SORGHUM	1 A. CORN AND RAPE	1 A. OATS followed by COWPEAS
		1/2 A. GARDEN	1/4 A. POTATO	1/4 A. ORCH.
		1/2 A. HOUSE YARD		

FIG. 10.—This shows good selection of crops for a small mountain farm on the high plateaus where pasture grasses do well and where oats and wheat are well adapted. Usually such a farm will have an untillable wooded area equaling or exceeding the area which can be used for crops and permanent pasture. As a rule the tillable areas are scattered here and there on the farm, making it difficult to divide it into regular fields. However, it is possible always to keep the acreages of each crop about the same each year, so that such a four-year rotation as is suggested in the diagram can be followed with reasonable regularity. For other practical rotations, see p. 26.

be cut for hay or hogged off. Red clover should be sown with the oats. This will make good fall pasture after the oats are off, as well as regular summer pasture the next year. The clover sod should be turned late in the fall of the second year for corn the next spring. Cowpeas or soy beans may be planted with the corn. Cowpeas should be planted in the same row with the corn, to climb up the

stalks. Soy beans, which do not climb, should be planted either in alternate rows with corn or alone in part of the field, and cultivated the same as the corn. At the last cultivation of the corn, rape should be sown broadcast between the rows of corn, to furnish green pasture for hogs. Water should be available for hogs in each of the three fields. A permanent pasture should also be available nearby. This may be an alfalfa field of an acre or two or several acres of bluegrass or other pasture grasses adapted to the soil. Sweet clover is also an excellent hog pasture and may be used instead of alfalfa. For preparing the land for alfalfa or sweet clover see page 17.

Sheep may assist in utilizing these pasture crops. These animals will make good use of the crops usually left to waste by hogs. Rape sown at the last cultivation of the corn in the regular field rotation may be pastured by sheep late in the fall. This, together with pasture on winter wheat, would enable such a farm to keep more sheep than usual. Instead of oats, wheat, and buckwheat occupying one of the 8-acre fields, the entire area might in some cases be sown to rye and hairy vetch at the last cultivation of corn. This would furnish late fall, early spring, and summer pasture for sheep. This would be a good scheme of management for those wishing to specialize in sheep. The lambs pastured on such a crop would be in excellent shape for the July and August market.

A farm rearranged and improved as above described should carry 4 to 5 cows, 8 to 12 young cattle, 2 or 3 brood sows with at least 15 to 20 pigs a year, and 15 to 20 ewes. Cheese making would be a profitable industry on these farms. In fact, conditions ought to be more favorable for cheese making here than in situations where pastures are more difficult to maintain. In one county in northern West Virginia, the value of cheese produced and sold in 1910 was about \$34,000. Only a few counties produce any cheese at all, but the industry should be extended in all mountain counties, especially where markets are difficult to reach. For cheese production, the silo will be found a profitable investment on many farms.

Instead of the plan of rotation shown in figure 10, the following rotation might be considered on these small grazing farms:

First year.....	Corn, with rape and rye sown at last cultivation.
Second year.....	Buckwheat, rye, and vetch, in the same proportions as in figure 10, with red clover and grass sown in early spring.
Third year.....	Clover and grass.
Fourth year.....	Clover and grass.

Where a market is available for Irish potatoes, these may take the place of part of the corn land in this rotation. Rye and vetch may be sown with the buckwheat if the land is sufficiently fertile

and the season favorable. Grass seed should be sown with the grain crops. This system would greatly increase the amount of pasture without greatly increasing the amount of grain production.

OTHER PRACTICAL ROTATIONS.

Some farmers may find it more desirable and practical to follow rotations somewhat different from those already described. For this reason two more simple and practical rotations are suggested.

A FIVE-YEAR ROTATION SUITED TO A MEDIUM-SIZED GENERAL FARM.

First year.....	Corn, followed by winter cover crop of rye or pasture and green manure.
Second year.....	Cowpeas or soy beans.
Third year.....	Rye or other small grain.
Fourth year.....	Clover and grass.
Fifth year.....	Clover and grass.

This rotation is recommended by the Tennessee Agricultural Experiment Station for general farming on the Cumberland Plateau and has been in favor with many thousands of farmers.

On a medium-sized farm of at least 50 to 60 acres of crop land, this is an excellent rotation, especially for the more southern part of the region. Here, generally speaking, a 5-year rotation is considerably better than a 3-year or 4-year rotation. On a farm with only 25 to 30 acres of land available for crops, the rotation might not furnish enough grain in proportion to meadow and grass. In any case, however, the condition of soil and the type of farming to be followed would need to be taken into consideration. A small dairy farm, for instance, could utilize the meadow and pasture to great advantage, and such a type of farming would soon build up the land so that the increased yield of grain would offset the smaller acreage in such a rotation. A small hog farm, on the other hand, would, as a rule, be more profitable with a shorter rotation and more feedable grains.

In places where Irish potatoes do well, and where there is a market for them, these could take the place of clover and grass in the fifth year. In that case a cover crop should follow potatoes. Crimson clover, where it thrives, would be excellent for this purpose. Otherwise rye should be used.

A FOUR-YEAR ROTATION WELL ADAPTED TO SMALL MOUNTAIN FARMS.

First year.....	Corn.
Second year.....	Sorghum for forage.
Third year.....	Spring oats.
Fourth year.....	Clover and grass.

This rotation also is recommended by the Tennessee station for mountain farming on the Cumberland Plateau. It has been successfully used by mountain farmers in Tennessee and is well adapted to thin soils.

In high, cold places, and where the soil is fairly good, oats might take the place of sorghum in the second year. In many cases Canada field peas could be sown with the oats. This practice would add greatly to the value of the crop if cut for hay or if it is to be hogged down.

Rape, instead of Canada peas, could be sown with the oats. This crop would provide pasture for hogs or sheep after the oats are harvested and before the clover and grass are ready to be pastured. Clover and grass, of course, would be sown with the oats early in the spring.

Where buckwheat is grown successfully, as on the high plateaus of West Virginia, the following four-year rotation would succeed very well:

First year-----	Corn, or partly corn and potatoes.
Second year-----	Spring oats and Canada field peas, cut for hay or hogged off, and followed by buckwheat, with which clover and grass are seeded.
Third year-----	Clover and grass.
Fourth year-----	Clover and grass.

When it is desirable to thrash some oats the farmer can sow a part of the field to spring oats alone, sowing clover and grass seed early in the spring with the oats. This plan provides grass and clover on the entire field the second year.

USEFUL PUBLICATIONS.

The following bulletins published by the United States Department of Agriculture and the State experiment stations should be helpful in establishing better farming in the Southern Allegheny Mountains. Most of these bulletins may be obtained free of charge.

AVAILABLE FOR FREE DISTRIBUTION BY THE U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

- Sweet Clover; Growing the Crop. (Farmers' Bulletin 797.)
- Killing Hogs and Curing Pork. (Farmers' Bulletin 913.)
- Home Canning. (Farmers' Bulletin 839.)
- Home Canning of Fruits and Vegetables. (Farmers' Bulletin 853.)
- Drying Fruits and Vegetables in the Home. (Farmers' Bulletin 841.)
- How to Make Cottage Cheese on the Farm. (Farmers' Bulletin 850.)
- Neufchâtel and Cream Cheese: Farm Manufacture and Use. (Farmers' Bulletin 960).

EXPERIMENT STATION BULLETINS.

- Rational Improvement of Cumberland Plateau Soils. (Bulletin 101, Tennessee Experiment Station, Knoxville, Tenn.)
- Rational Improvement of Highland Rim Soils. (Bulletin 102, Tennessee Experiment Station, Knoxville, Tenn.)
- Fertility Experiments in a Rotation of Cowpeas and Wheat. (Bulletin 96, Tennessee Experiment Station, Knoxville, Tenn.)
- Liming of Tennessee Soils. (Bulletin 97, Tennessee Experiment Station, Knoxville, Tenn.)
- Lime for Virginia Farms. (Bulletin 187, Virginia Experiment Station, Blacksburg, Va.)
- Alfalfa and Sweet Clover. (Bulletin 178, Kentucky Experiment Station, Lexington, Ky.)

IN THE FIELD of agriculture we have agencies and instrumentalities, fortunately, such as no other government in the world can show. The Department of Agriculture is undoubtedly the greatest practical and scientific agricultural organization in the world. Its total annual budget of \$46,000,000 has been increased during the last four years more than 72 per cent. It has a staff of 18,000, including a large number of highly trained experts, and alongside of it stand the unique land grant colleges, which are without example elsewhere, and the 69 State and Federal experiment stations. These colleges and experiment stations have a total endowment of plant and equipment of \$172,000,000 and an income of more than \$35,000,000 with 10,271 teachers, a resident student body of 125,000, and a vast additional number receiving instructions at their homes. County agents, joint officers of the Department of Agriculture and of the colleges, are everywhere cooperating with the farmers and assisting them. The number of extension workers under the Smith-Lever Act under the recent emergency legislation has grown to 5,500 men and women working regularly in the various communities and taking to the farmer the latest scientific and practical information. Alongside these great public agencies stand the very effective voluntary organizations among the farmers themselves which are more and more learning the best methods of cooperation and the best methods of putting to practical use the assistance derived from governmental sources. The banking legislation of the last two or three years has given the farmers access to the great lendable capital of the country, and it has become the duty of both of the men in charge of the Federal Reserve Banking System and of the Farm Loan Banking System to see to it that the farmers obtain the credit, both short term and long term, to which they are entitled not only, but which it is imperatively necessary should be extended to them if the present tasks of the country are to be adequately performed. Both by direct purchase of nitrates and by the establishment of plants to produce nitrates, the Government is doing its utmost to assist in the problem of fertilization. The Department of Agriculture and other agencies are actively assisting the farmers to locate, safeguard, and secure at cost an adequate supply of sound seed. The Department has \$2,500,000 available for this purpose now and has asked the Congress for \$6,000,000 more.—*From President Wilson's Message to Farmers' Conference at Urbana, Ill., January 31, 1918.*